U. S. Geological Survey's Data, Knowledge, and Models to Help Build an Environmental Public Health Tracking Network

by
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Goals of Presentation

- Provide a preview of data and information that a CDC/USGS project will provide to grantees to help define water quality issues for domestic (private) water supplies
- Get feedback on the usefulness of these data and information
- Demonstrate how these data and information can be used

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Data

- Water Quality Data
  - NAWQA: systematic data collection and analysis to define water quality in major aquifers
  - NWIS: repository of data from many USGS projects
- Ancillary Data
  - Trace elements in stream sediment
  - Geologic information
  - Water use information

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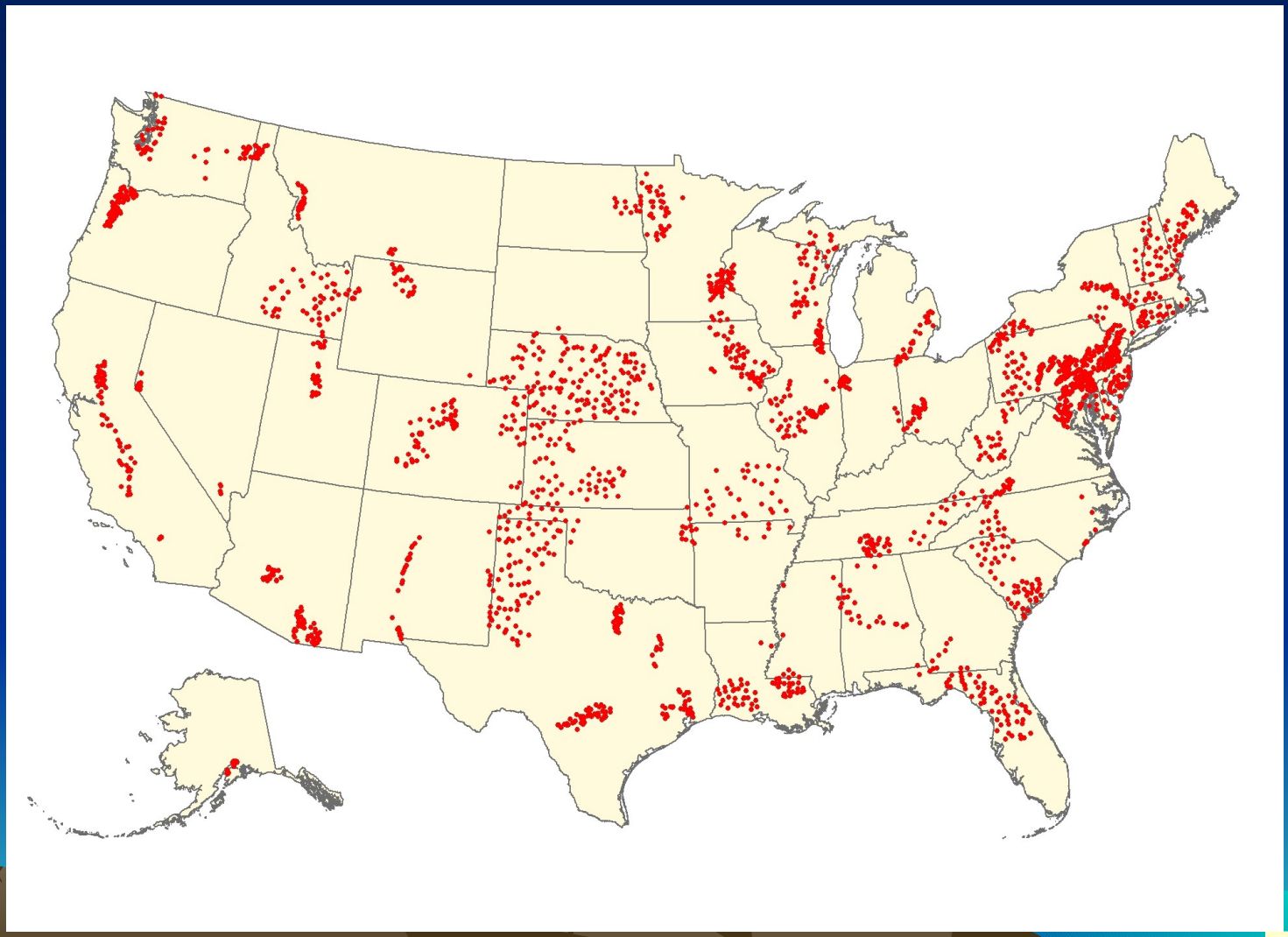
Location of Domestic (Private) Wells Sampled as Part of the NAWQA Program (n = 1,907)



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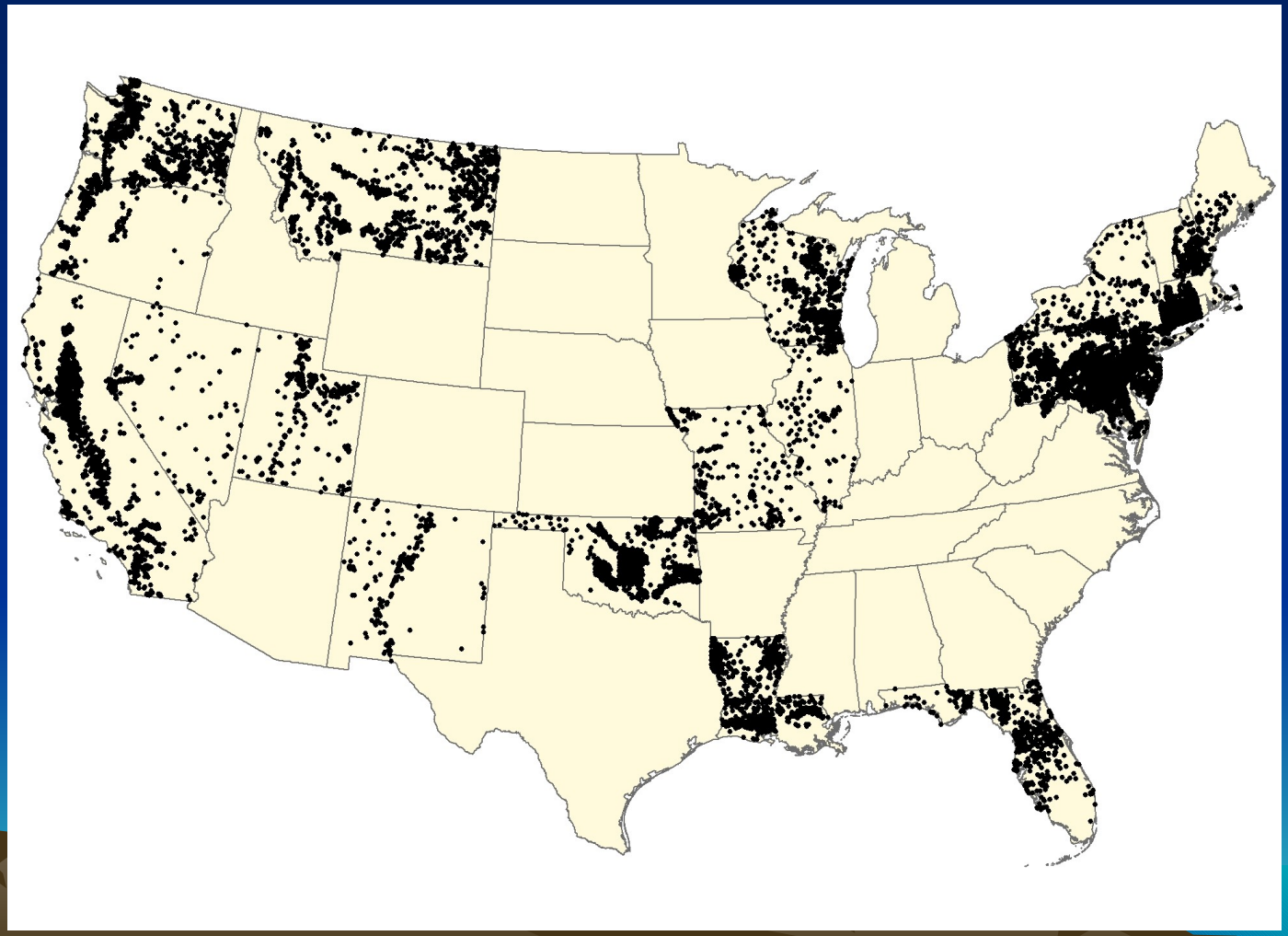
NWIS Domestic Wells With Water-Quality Data for 21 Grantee States (n = 27,971)



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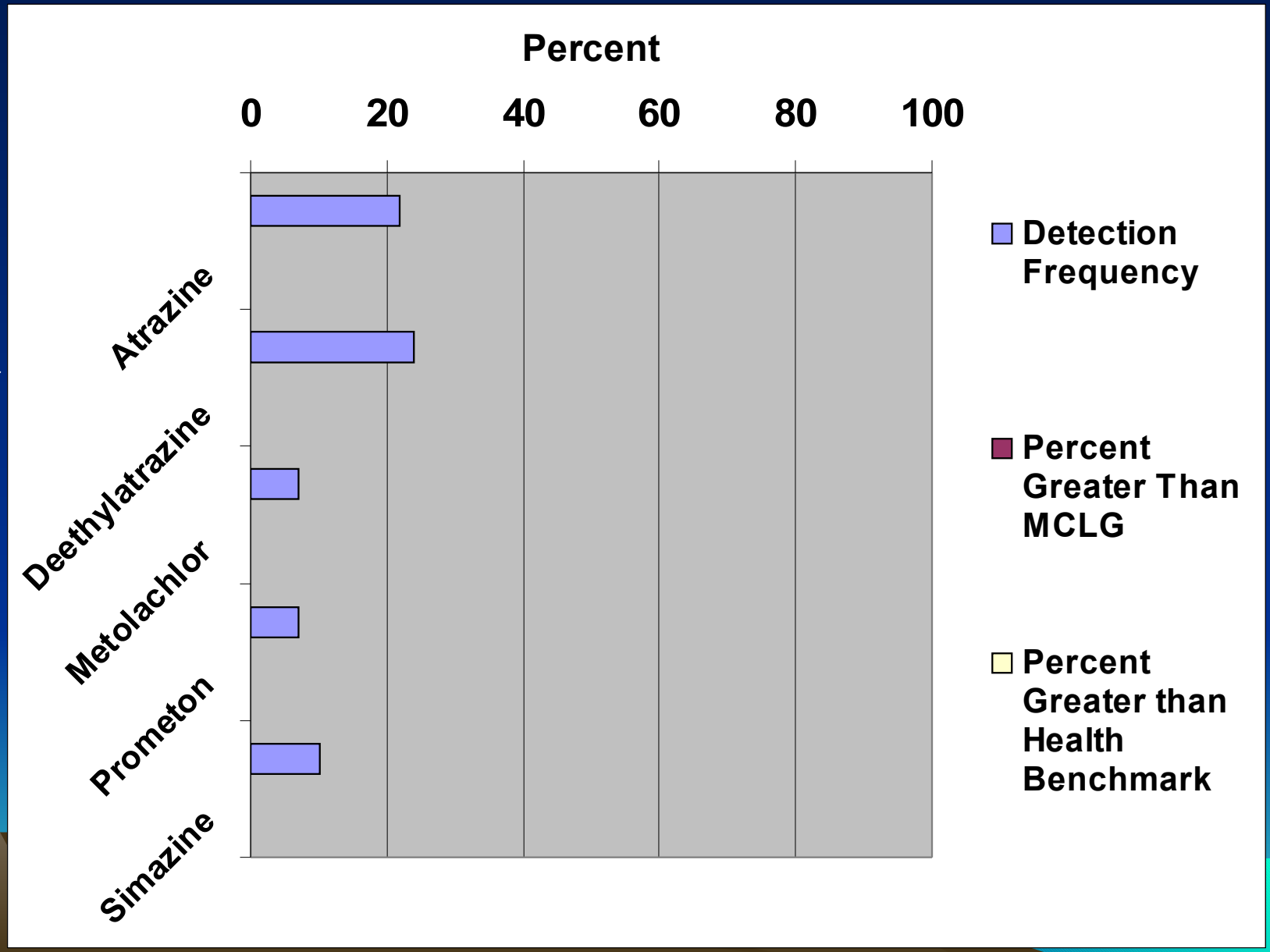
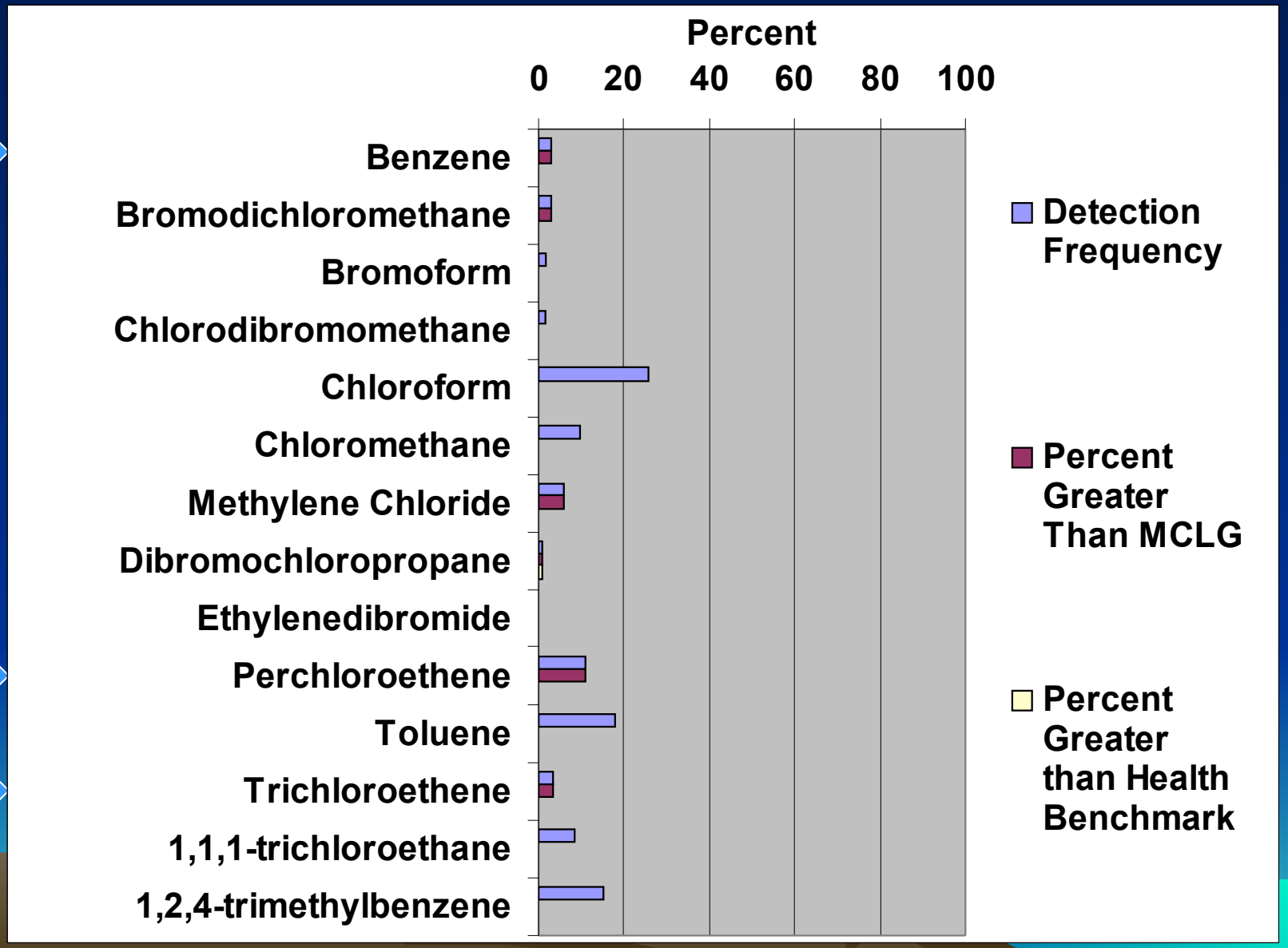
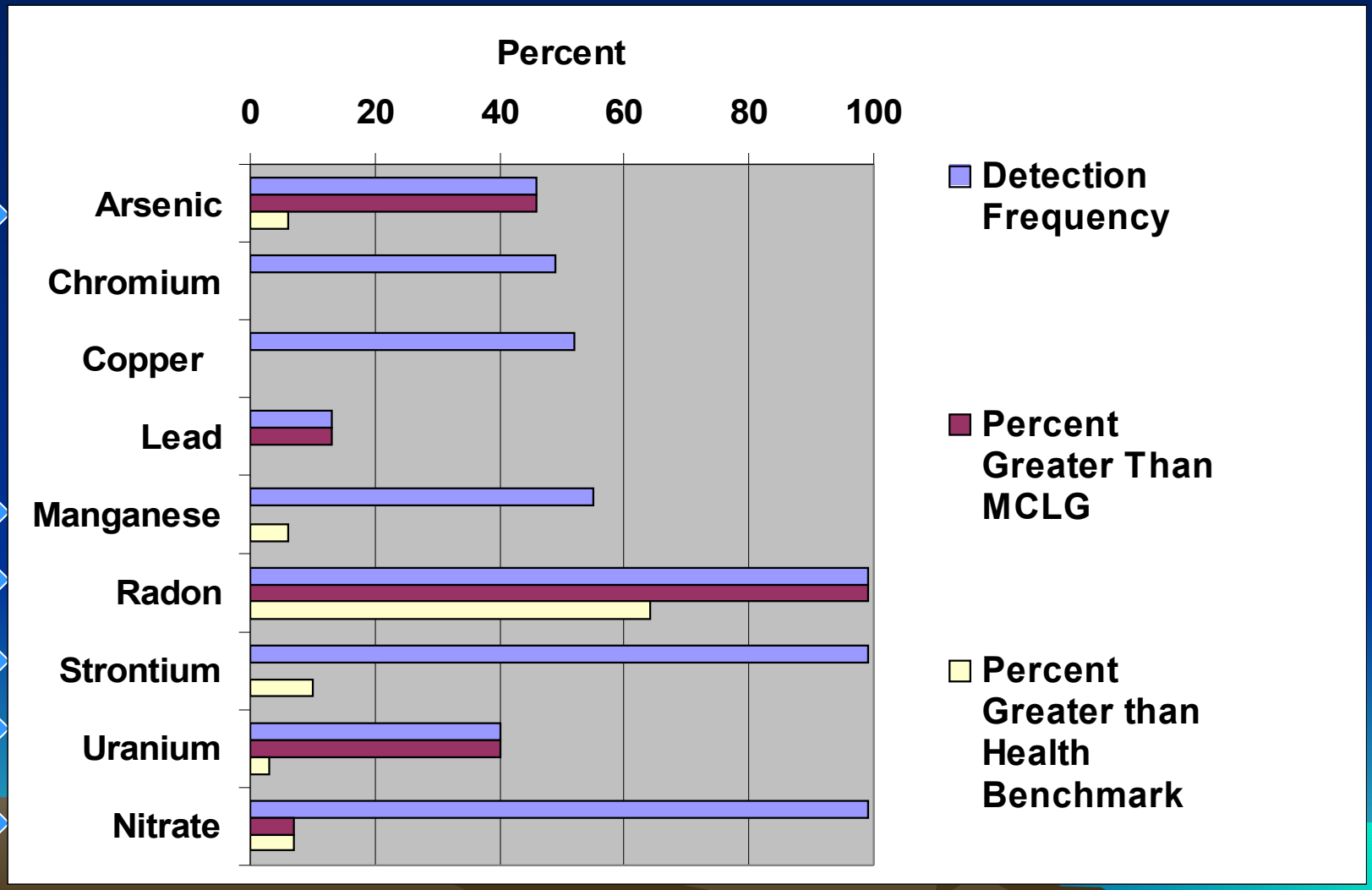
Which Pesticides Selected



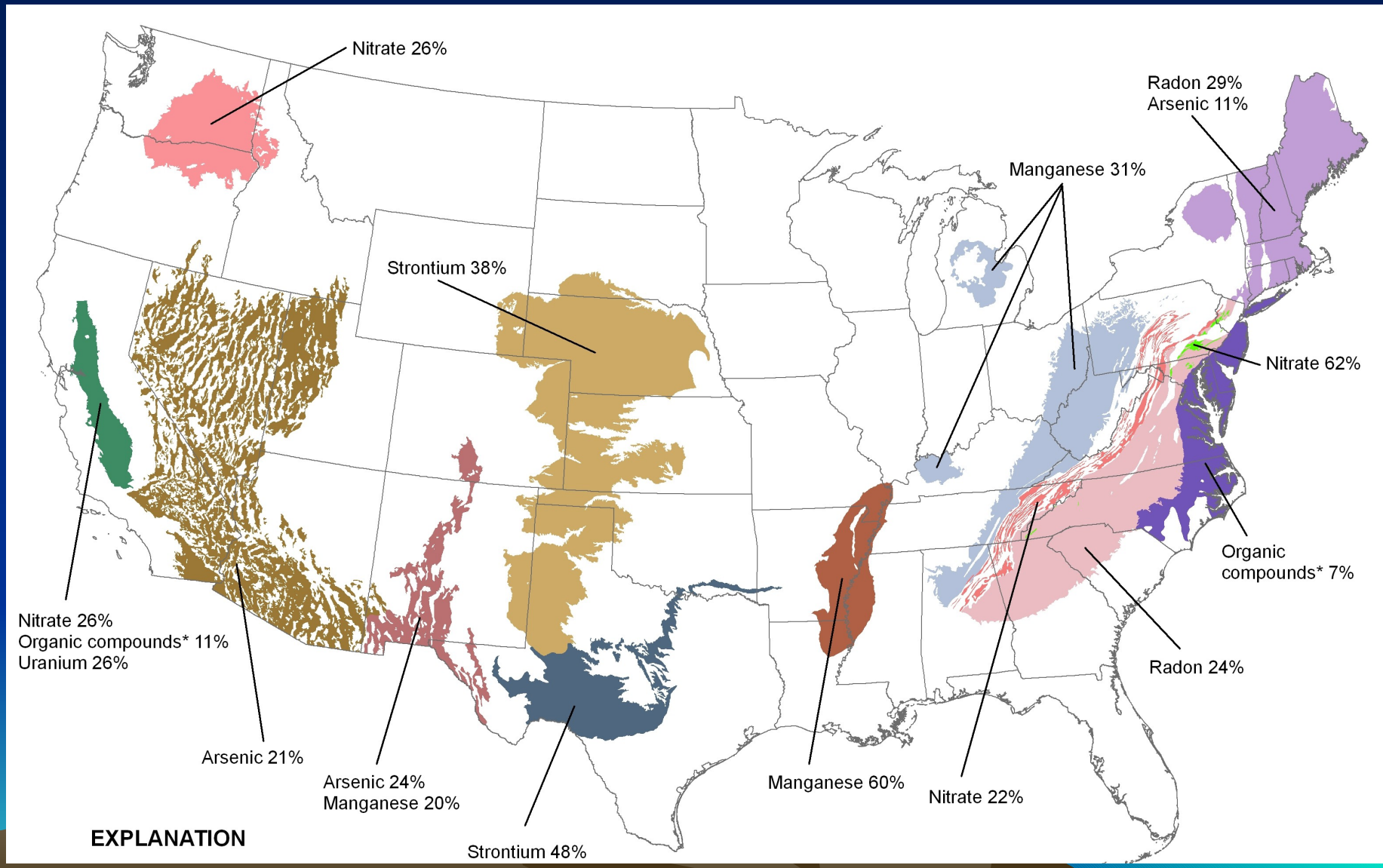
Which VOCs Selected



Which Trace Elements and Nutrients Selected



Water Quality by Principal Aquifer



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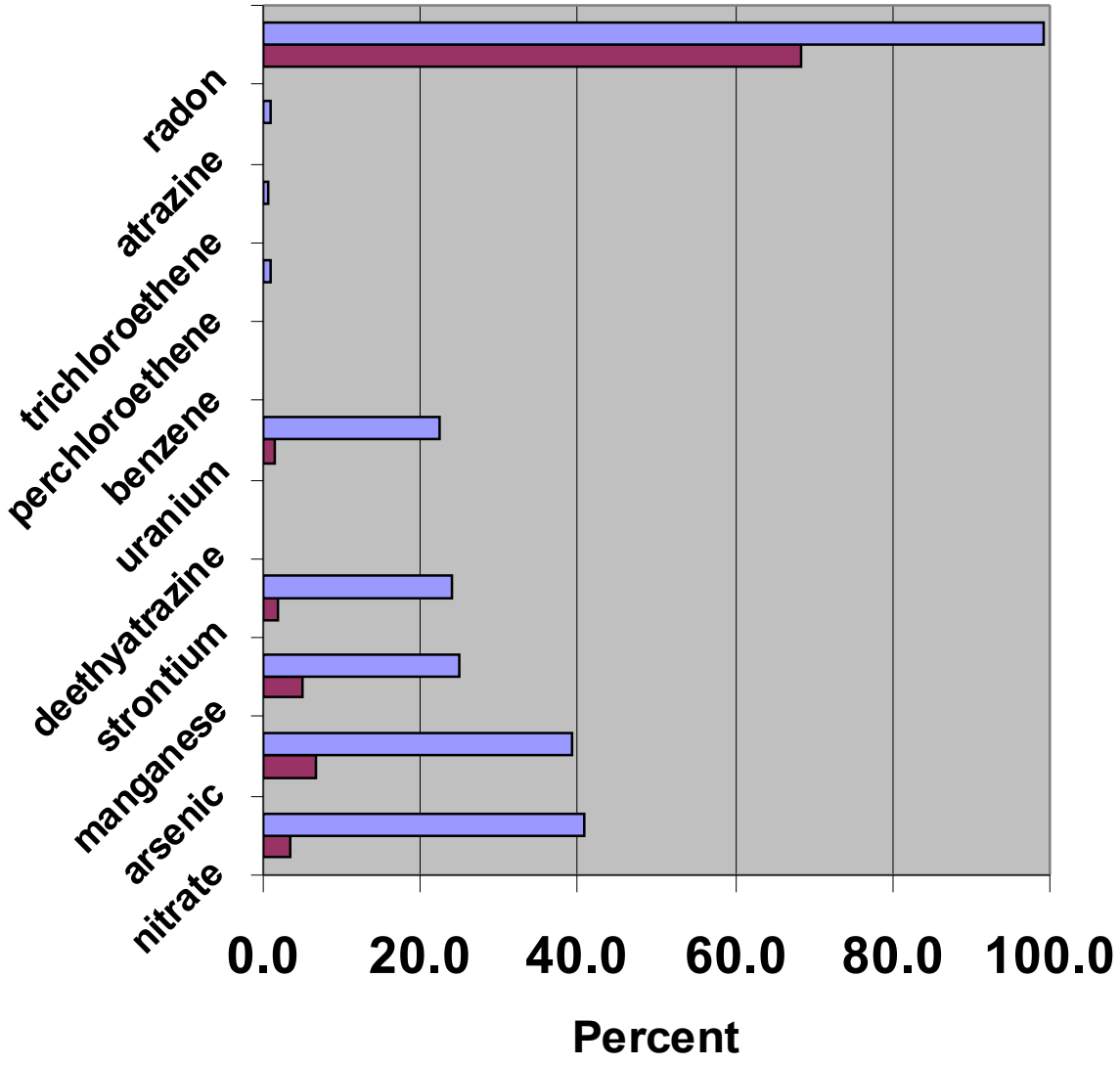
Results for 21 Grantee States



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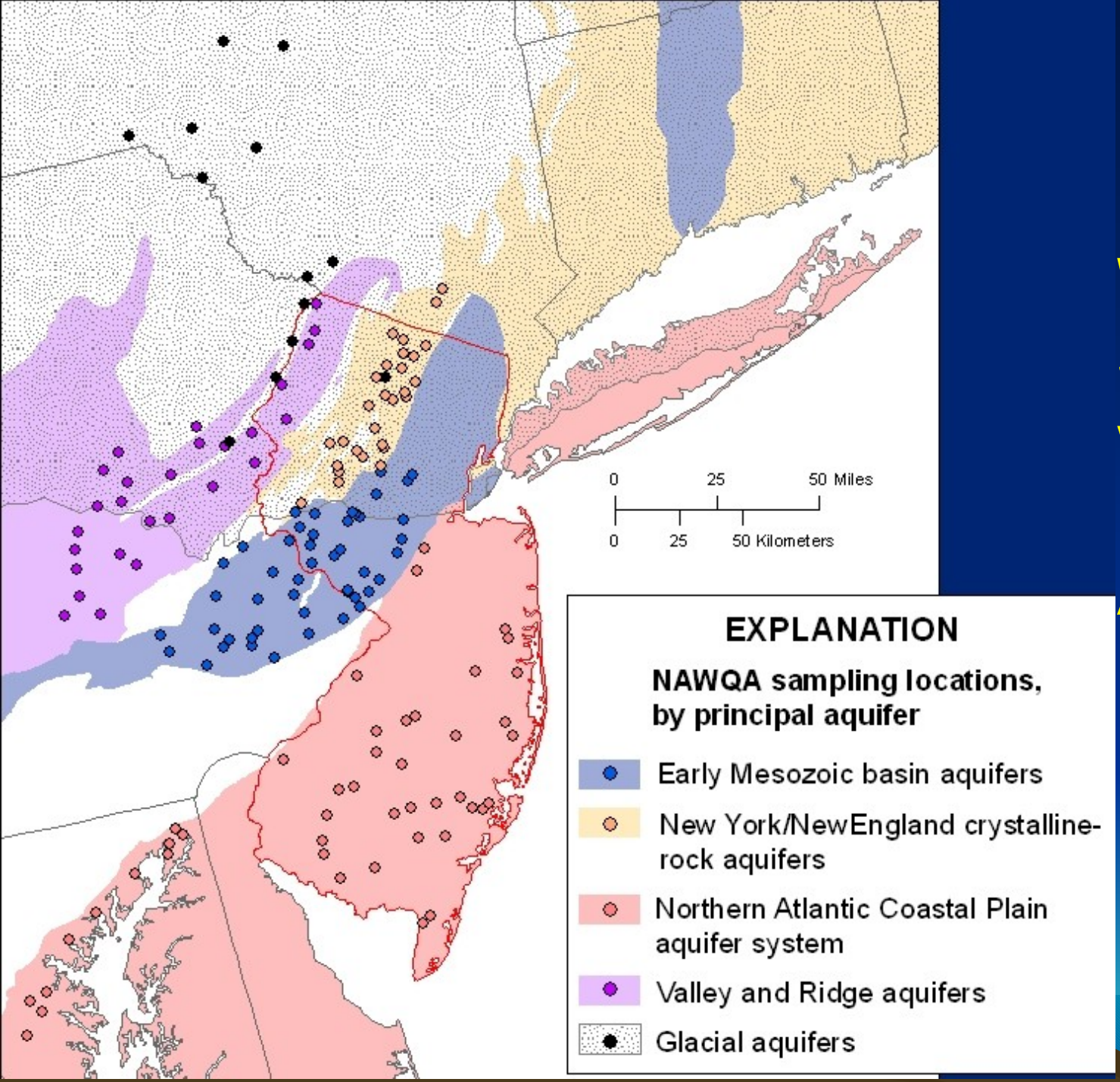
Domestic Wells Sampled with Principal Aquifers (NAWQA Data)



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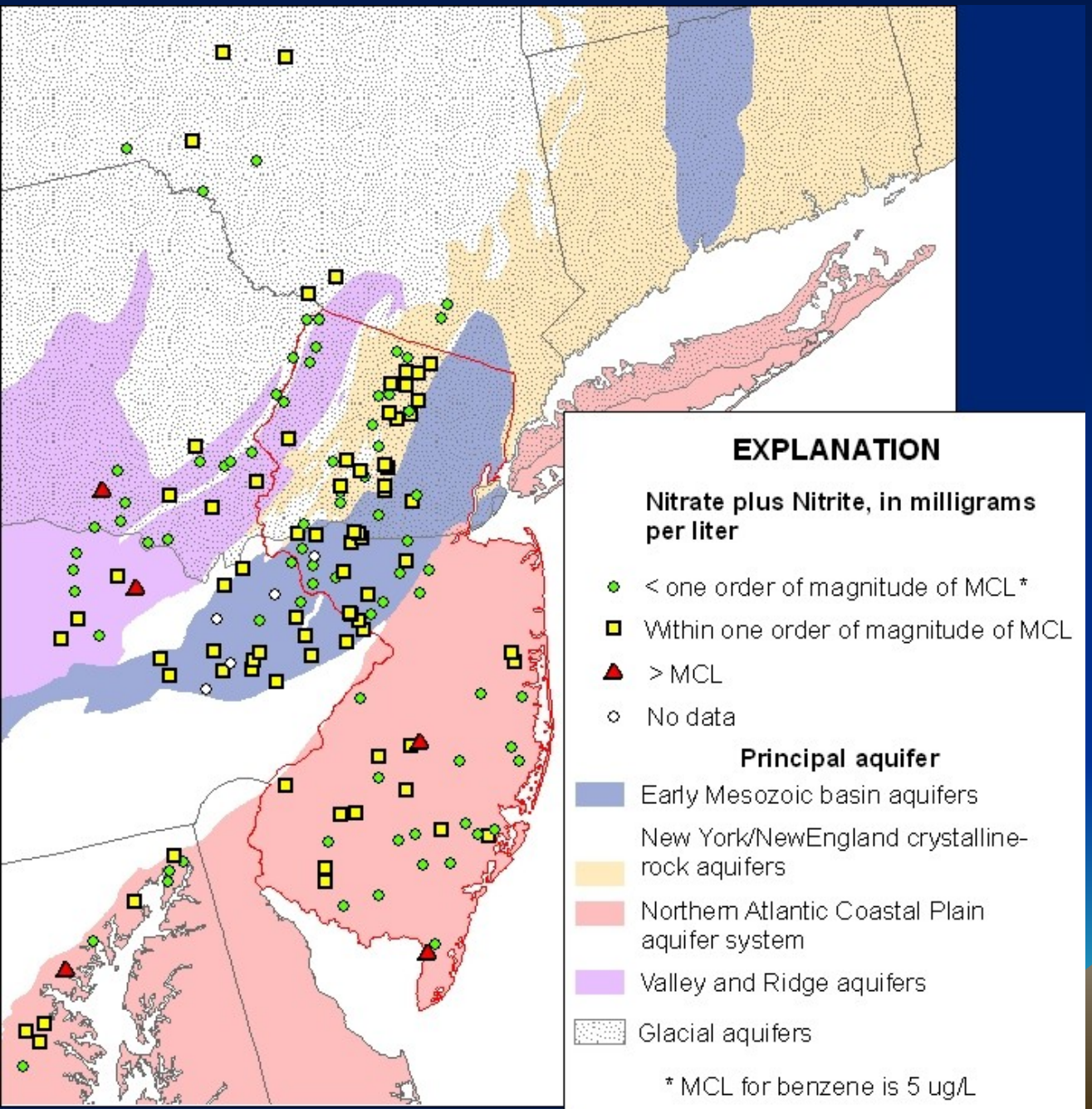
Nitrate Conc. With Principal Aquifers (NAWQA Data)



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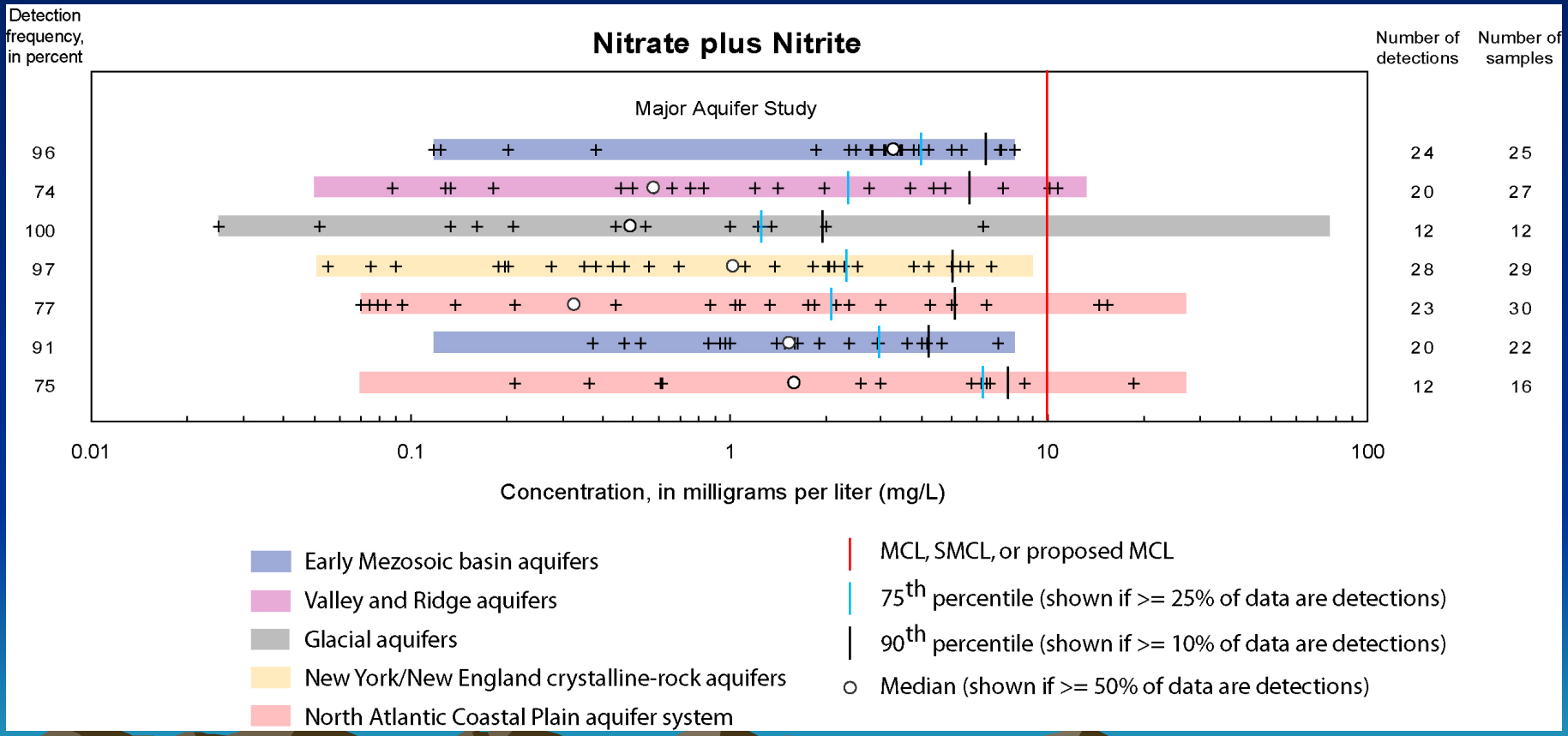
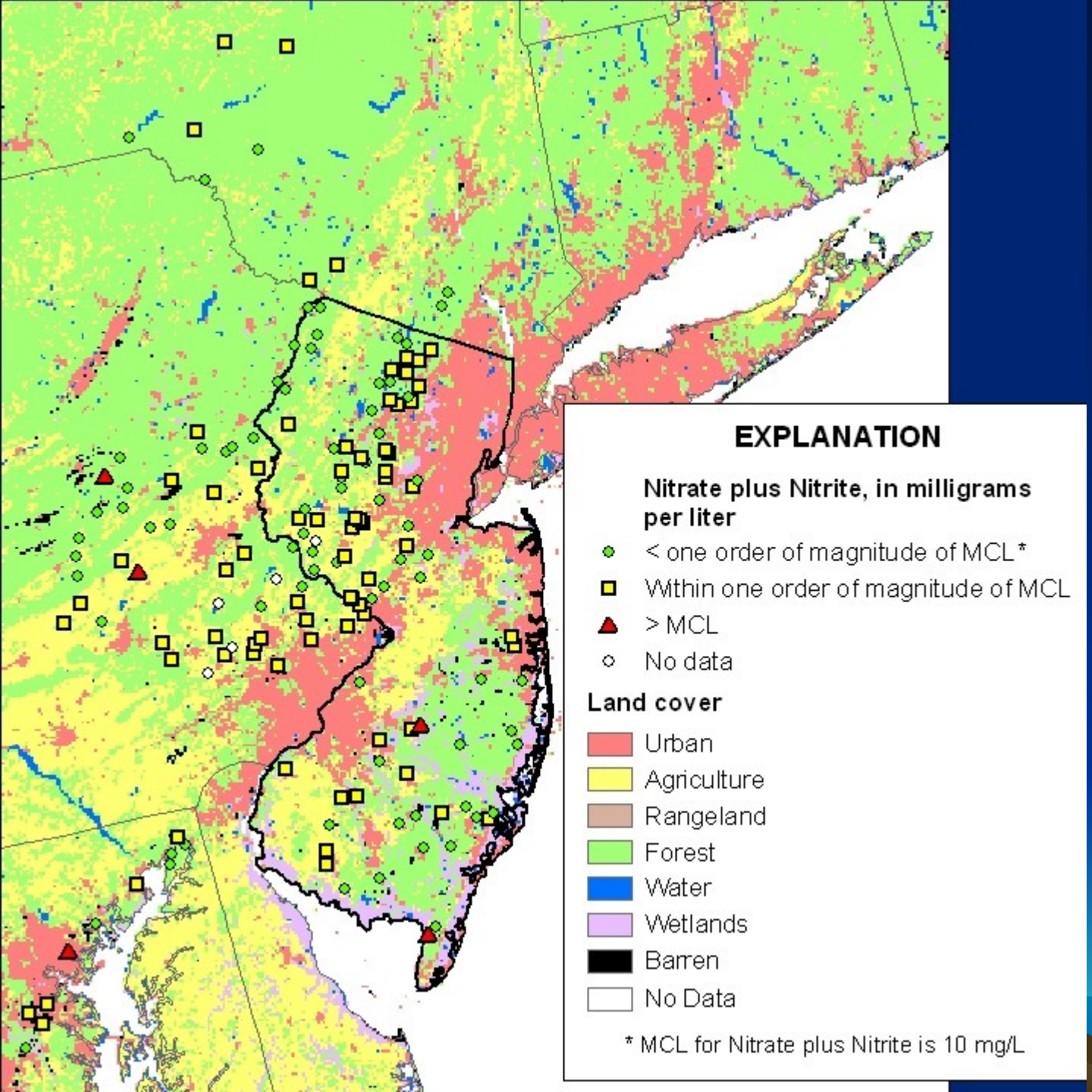
Nitrate Conc. by Principal Aquifer





Nitrate Conc. With Land Cover (NAWQA Data)

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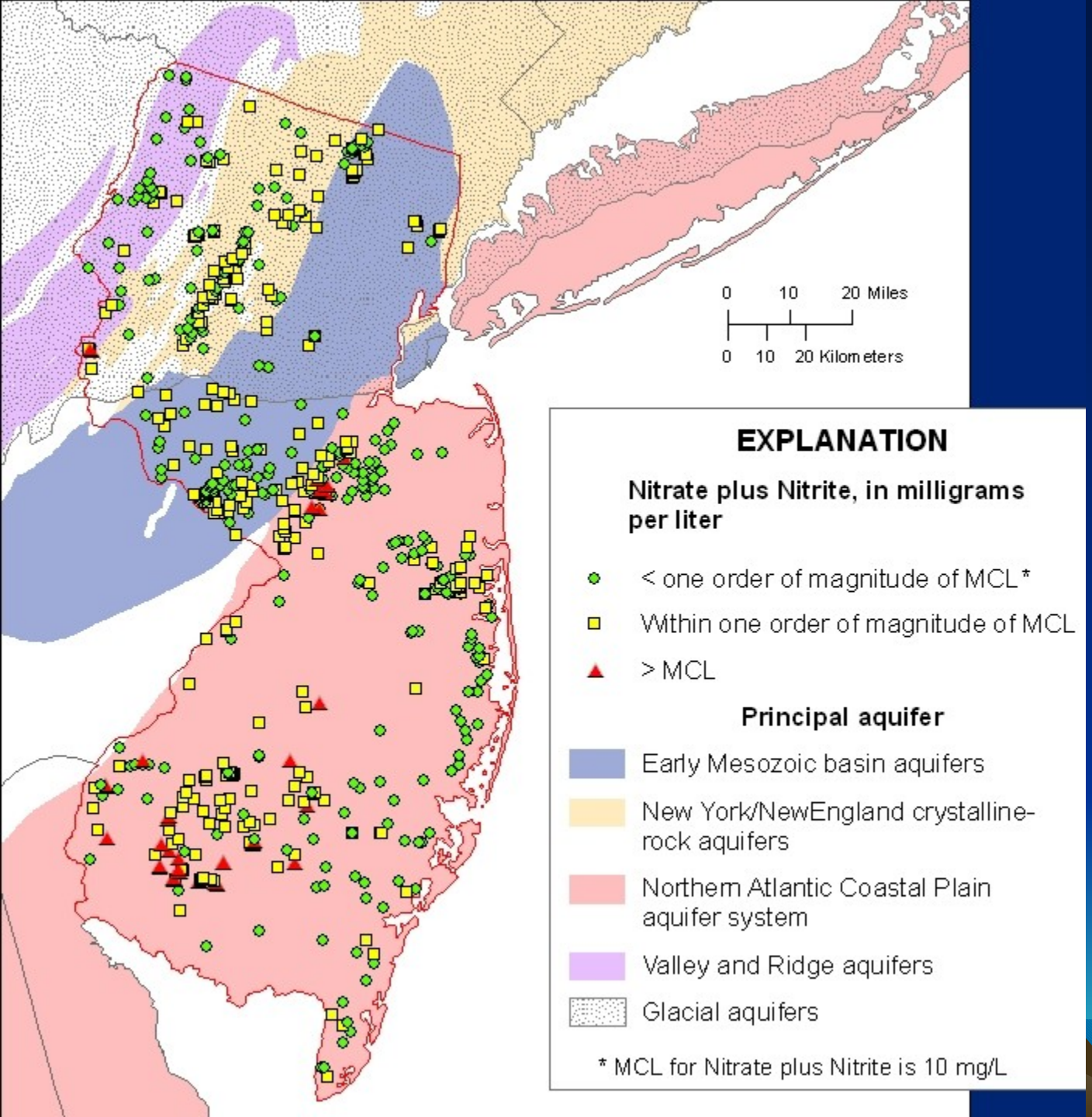

Nitrate Conc. With Principal Aquifers (NWIS Data)

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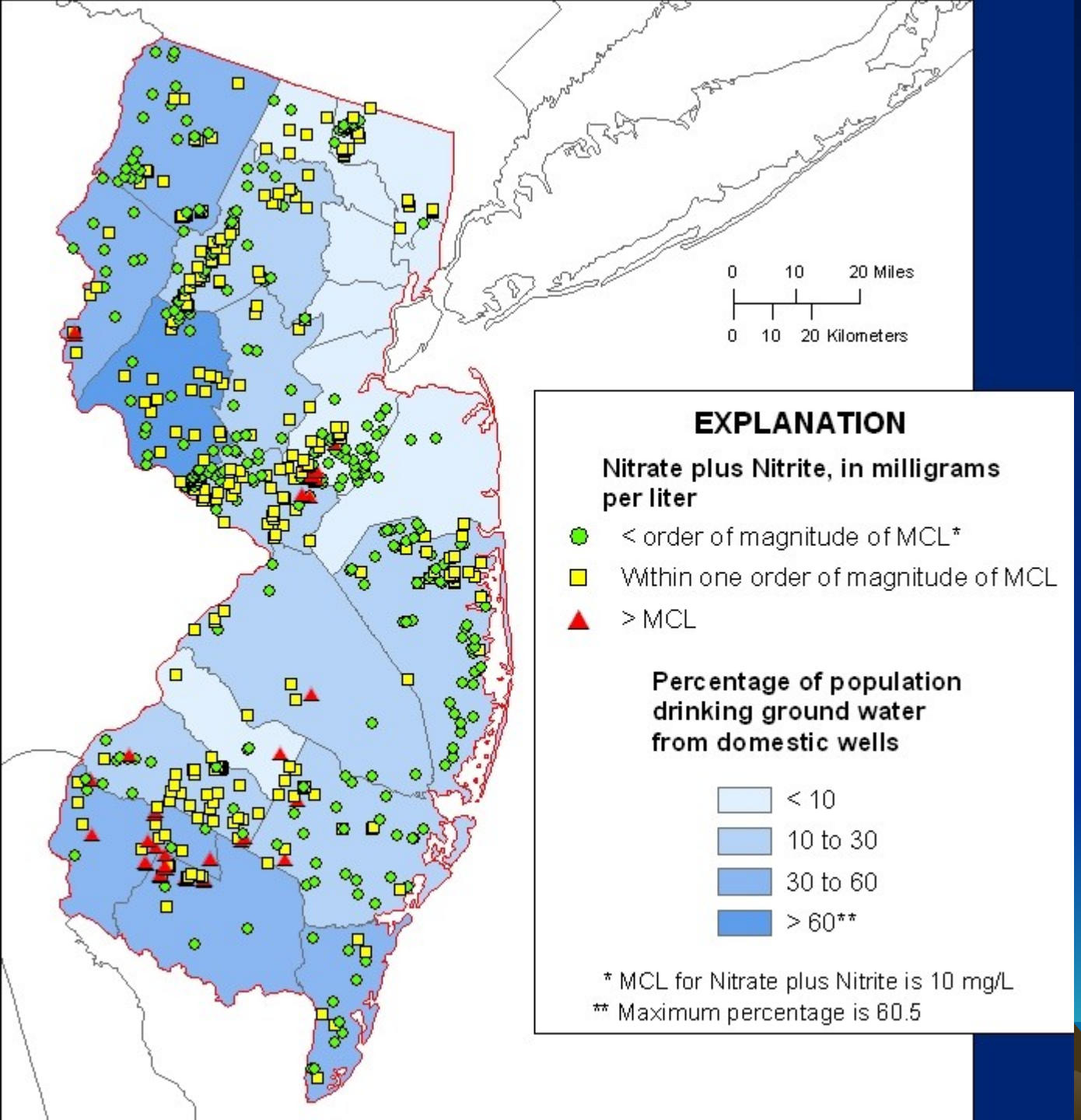

Nitrate Conc. With Water Use (NWIS Data)

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Knowledge

- Simulate Occurrrence, Distribution, and Concentrations by modeling source, transport, and fate of contaminants

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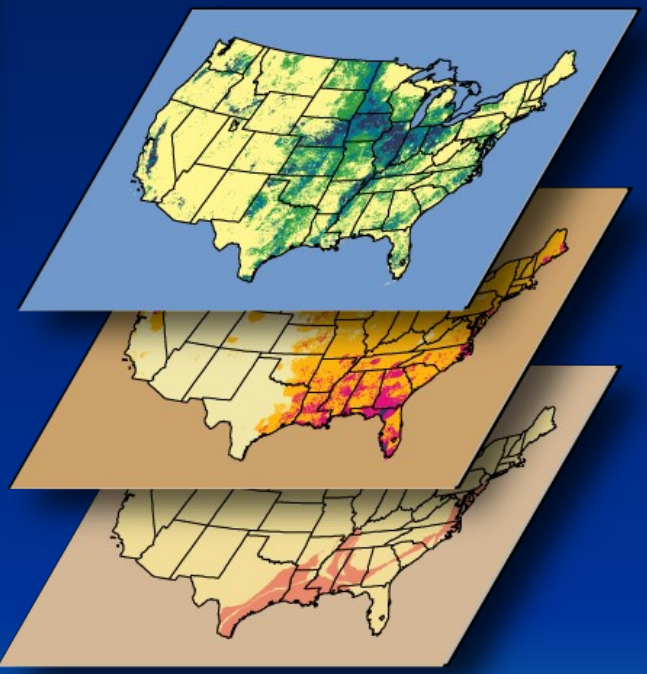
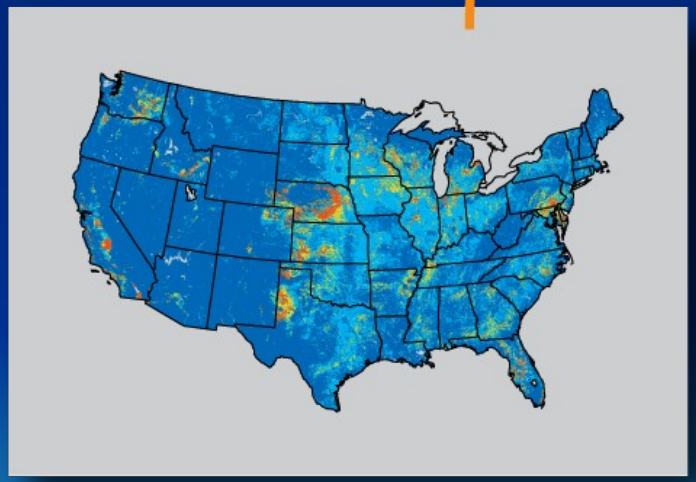
Monitoring

GIS



Prediction



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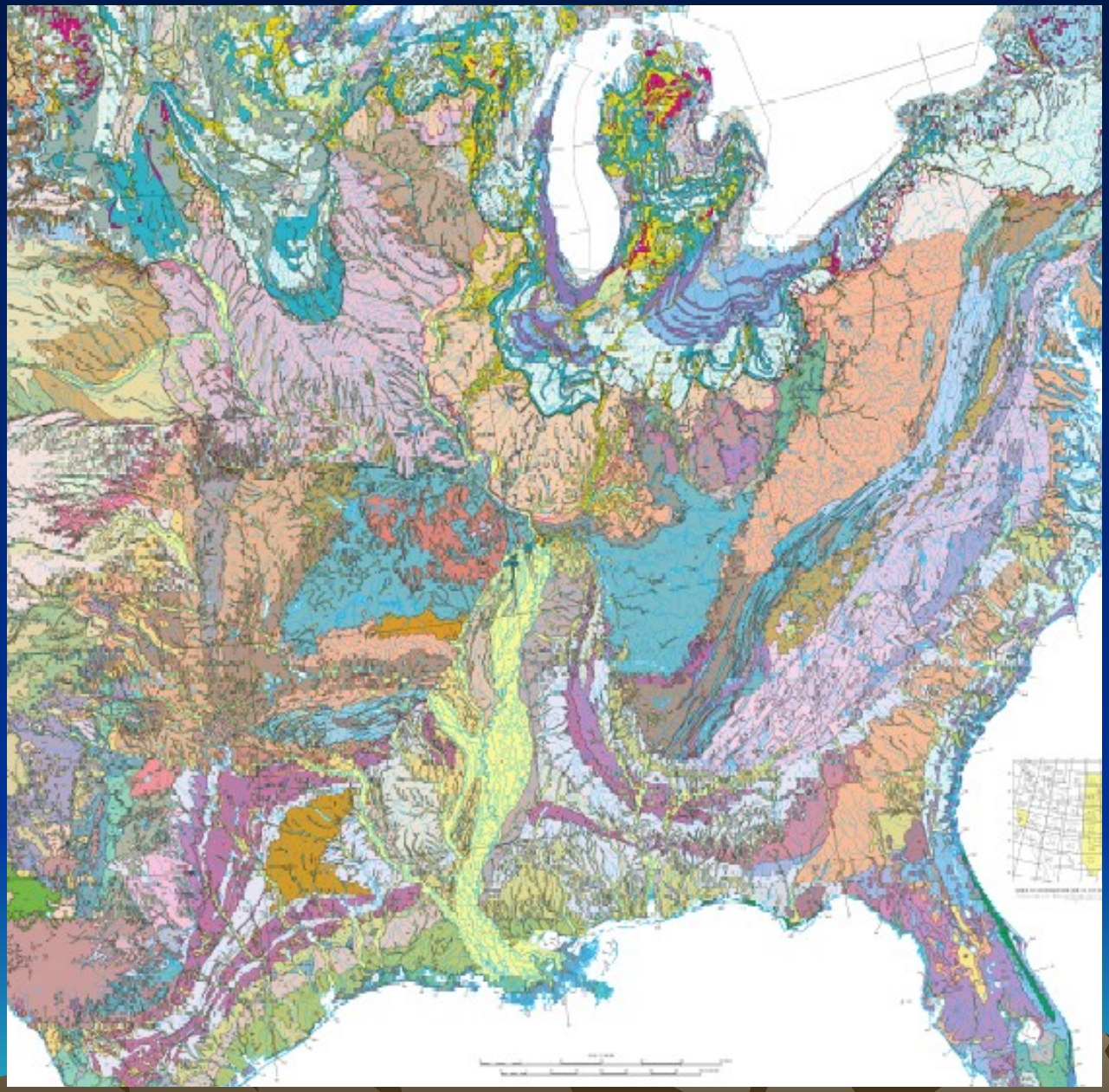

Map of Surficial Deposits and Materials

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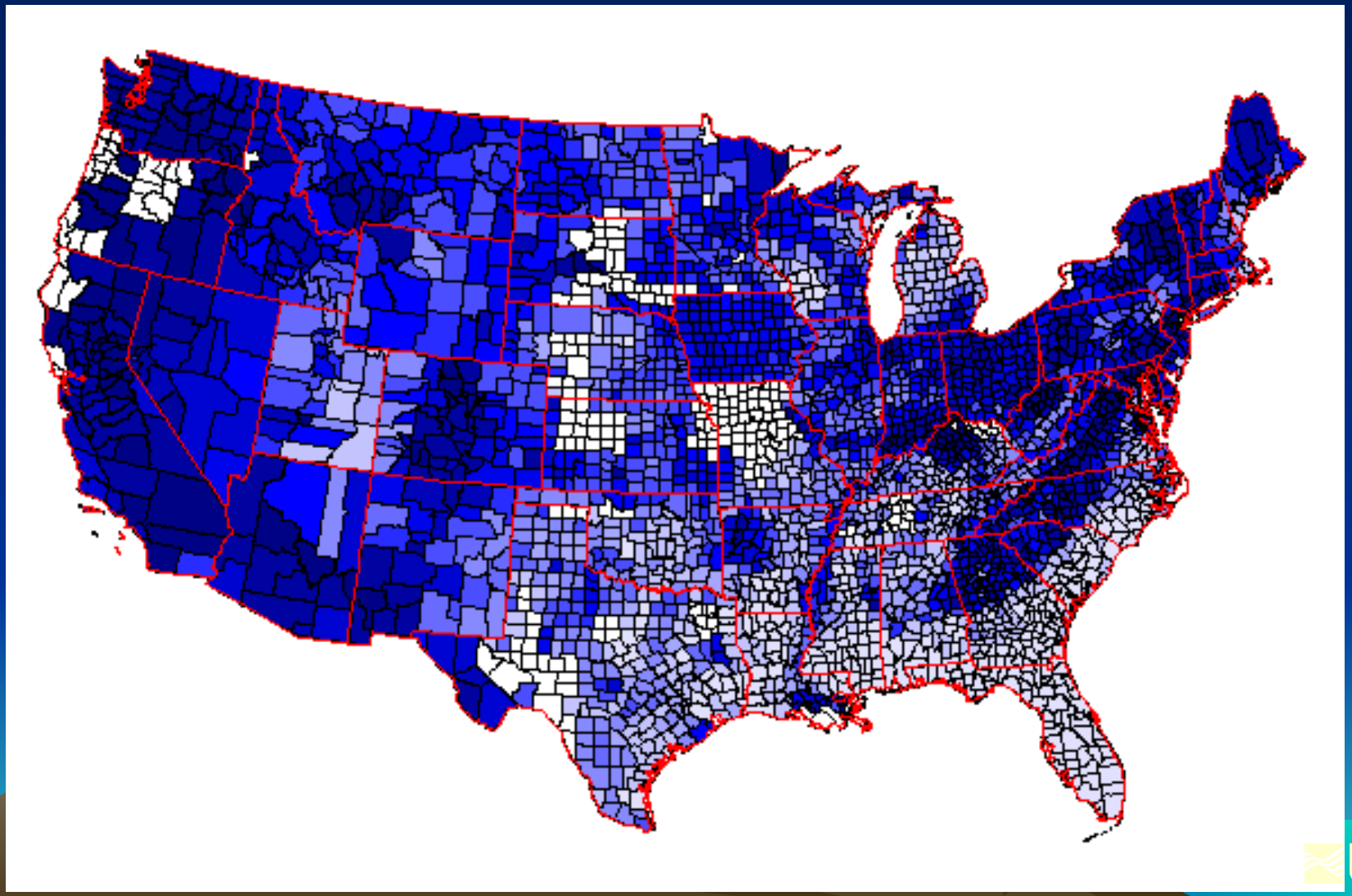
Arsenic in Stream Sediment



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Example:
Nitrate Model/Arsenic Models

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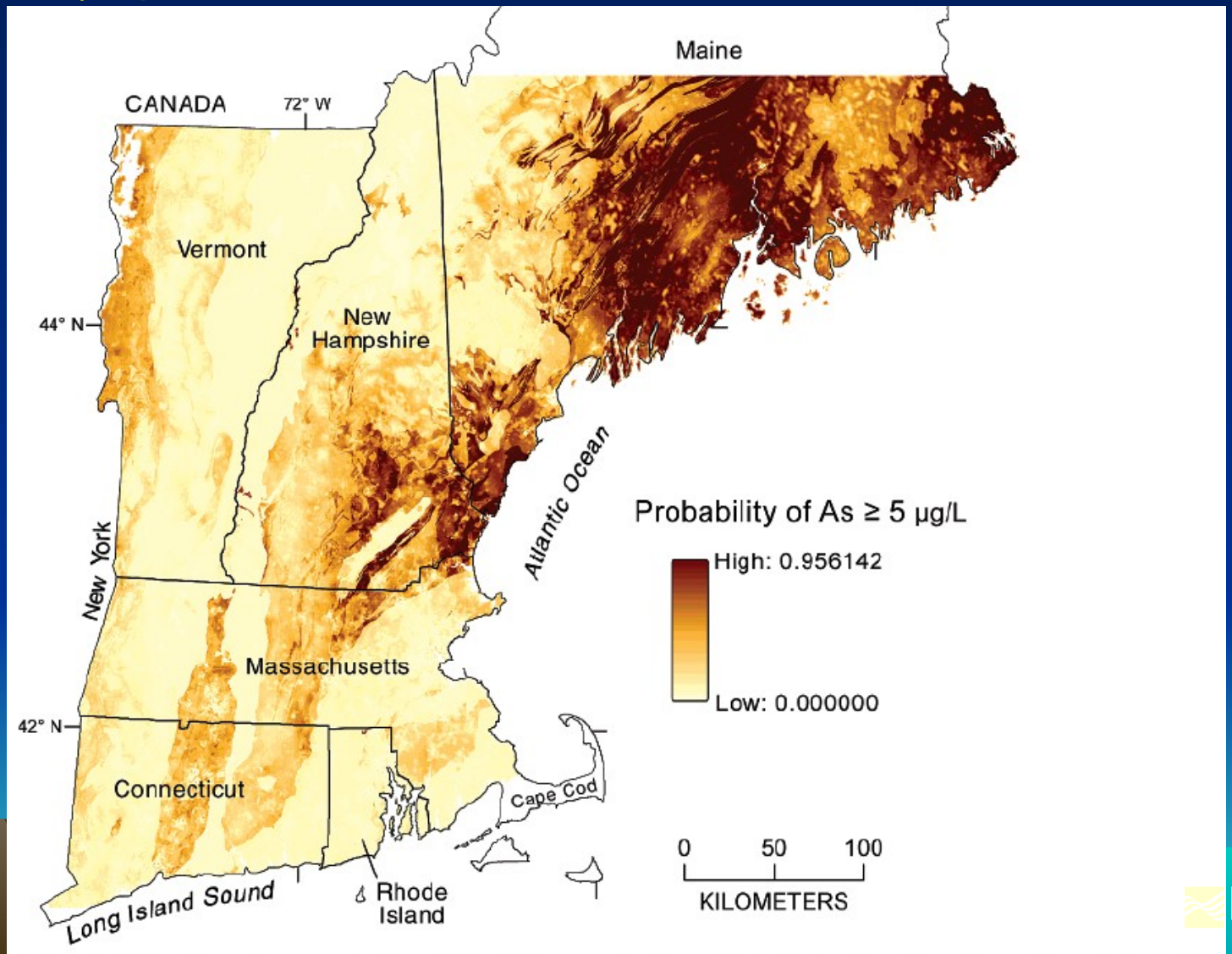
Probability of arsenic conc. ≥ 5 µg/L in bedrock aquifers



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Nitrate Drinking Water Model

Parameter	Coeff. sign	Significance Level (p)
Nitrogen source (β)		
Farm fertilizer	+	<0.01
Confined manure	+	<0.01
Orchards/vineyards	+	0.04
Population density	+	0.04
Transport to aquifer (α)		
Water input[a]	+	<0.01
Semiconsolidated sands	+	0.02
Sandstone and carb. rocks	+	<0.01
Glacial deposits	–	0.02
Drainage ditch	–	<0.01
Hortonian overland flow	–	<0.01
Attenuation (δ)		
Fresh surface water withdrawal	–	<0.01
Irrigation tailwater recovery	–	<0.01
Dunne overland flow	–	<0.01
Well depth	–	0.18

[a]ratio of irrigated land to precipitation

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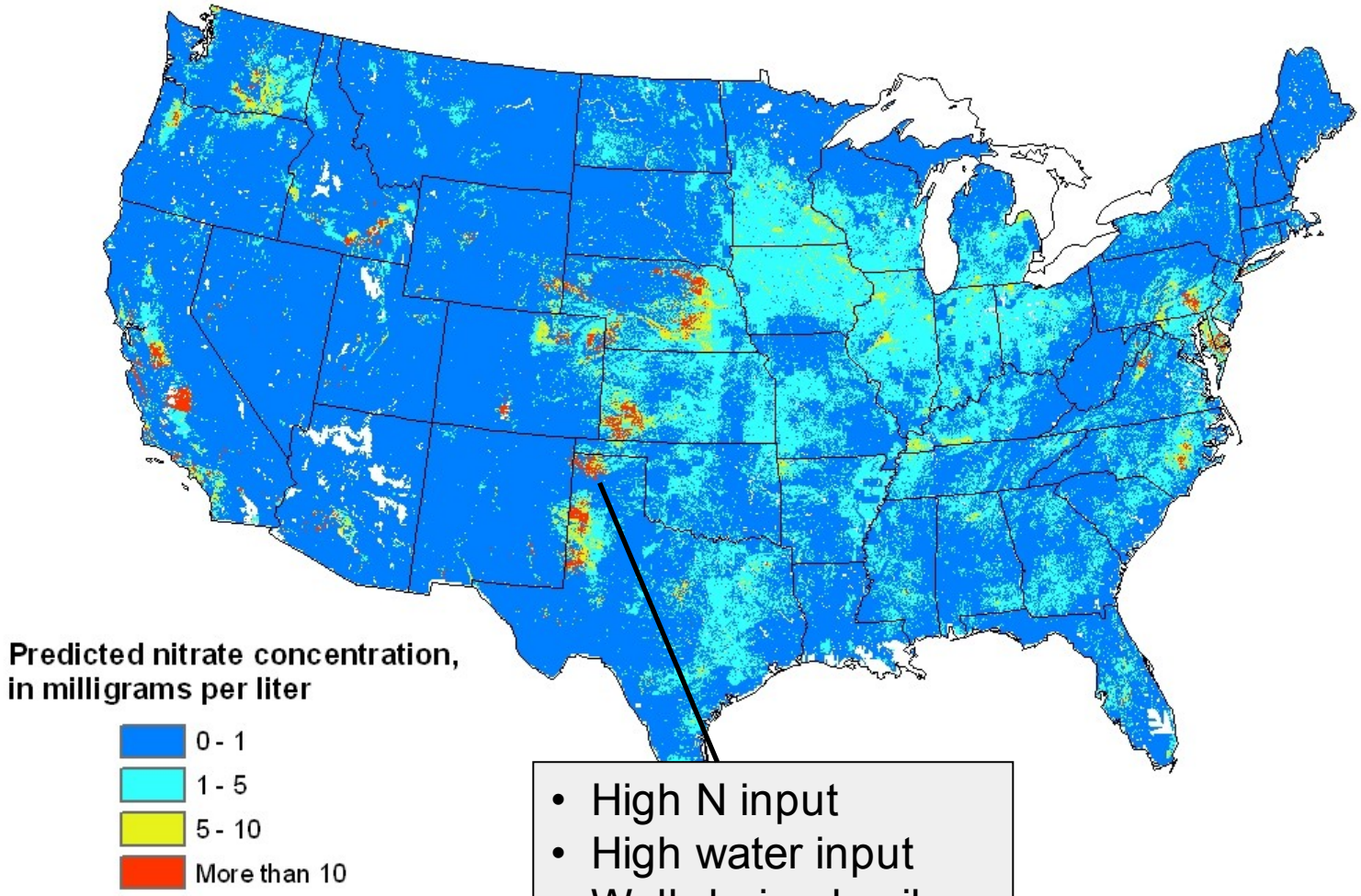
Prediction



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Population Scenarios

Hypothetical depth — "shallow"

Typical depth

Model → Reduce risk by seeking deeper supplies.

Predicted nitrate concentration range	Domestic well users in areas defined by depth: 30 ft	160 ft	Percent change
0 – ≤ 1 mg/L	19,400,000	20,000,000	+ 3
> 1 – ≤ 5 mg/L	13,300,000	13,000,000	– 3
> 5 – ≤ 10 mg/L	1,400,000	1,240,000	– 12
> 10 mg/L	528,000	467,000	– 12

1% of users

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Summary

- Two sources of USGS water quality data: NAWQA, NWIS
- 11 contaminants selected for investigation in 21 grantee states
- TE had occurrence and concentrations that were of greatest human health concern
- Models can be used to interpolate and extrapolate monitoring data

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